(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
26 September 2002 (26.09.2002)

PCT

(10) International Publication Number
WO 02/075205 A2

(51) International Patent Classification[7]: F21V

(21) International Application Number: PCT/GB02/01340

(22) International Filing Date: 21 March 2002 (21.03.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0107077.0 21 March 2001 (21.03.2001) GB

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 02/075205 A2

(54) Title: LIGHT FITTINGS

(57) Abstract: A light fitting for mounting in proximity to an associated artificial light source, the fitting comprising luminescent material which, in use is charged by light emitted from the light source so that the fitting produces a glow when the artificial light source is extinguished.

Light fittings

The present invention relates to light fittings.

Known light fittings, by which is meant fixtures, fittings and parts associated with an artificial light source, generally serve either a structural function, in mounting and supporting the light source, a safety function, by preventing people from getting too close to the light source, or an aesthetic function, in improving the appearance of the light source. Fittings are not generally used to provide any type of illumination in themselves.

The provision of emergency lighting is a very important concept. Emergency lighting, which typically provides a low level of illumination, is required to come on immediately if regular lighting goes out in the event of a power failure or if the regular lighting has to be extinguished for reasons of safety. However, existing emergency lighting systems tend to be powered by electricity, either from the mains, from emergency back-up generators or by battery. They are thus disadvantageous in that operation of them may become either difficult, impossible or dangerous, depending on the circumstances in which the regular lighting was extinguished.

Night lights are a further example of the provision of low level illumination. Known night lights include small electrical units which plug directly into a standard mains socket and give out a dim light. Therefore, they consume

electricity, and cannot be used in the event of a power failure.

The present invention seeks to alleviate the aforementioned disadvantages.

Accordingly, the present invention is directed to a light fitting for mounting in proximity to an associated artificial light source, the fitting comprising luminescent material which, in use, is charged by light emitted from the light source so that the fitting produces a glow when the artificial light source is extinguished.

The invention therefore provides a light source which operates immediately in the event of the artificial light being extinguished, without the need for electrical power and without the need for the switching on or operating of any device. The fitting can be discrete so that it forms an integral part of the existing artificial light installation without detracting from the appearance of the installation.

Preferably, the fitting is made from rubber, glass or a plastics material and the luminescent material is incorporated within the matrix of the fitting material. The luminous characteristic of the fitting is hence provided in a robust way, which is not liable to wear or damage. Alternatively, the luminescent material is provided in a coating applied to the surface of the fitting. Alternatively, the luminescent material is provided in a an adhesive tape applied to the surface of the fitting. These

latter methods offer the advantage that a conventional light fitting can be easily modified to give a fitting according to the present invention.

Preferably, the luminescent material comprises a rare earth metal. The rare earth metal is preferably europium or dysprosium.

Advantageously, the luminescent material further comprises an alkaline earth metal, which is preferably strontium.

Advantageously, the fitting further comprises a colourant material. Preferably, the colourant material is a pigment. Preferably, the pigment is provided in a polyamide co-condensate carrier which is compatible with rubber or plastics materials. The colourant material may be incorporated into the matrix of the fitting material, or alternatively, may be provided as a coating applied to the surface of the fitting. Luminous materials commonly have an unpleasant dull greenish hue, so the present invention seeks to overcome this by providing a colourant which does not interfere with the action of the luminous material, i.e. which does not unduly absorb either incoming light for charging the luminous material or the light given off by the luminous material. The fitting can be made in any colour which is required.

Preferably the colourant material imparts a white colour to the fitting. Many known light fittings and

fixtures are white or partly white, so use of a white colourant in the fitting gives a fitting which harmonises well with existing light installations.

In a preferred embodiment, the colorant material is stable up to 250 °C. Advantageously, the colourant material is light-fast and stable to ultra-violet light. Advantageously, the coating or coatings are stable up to 250 °C. These features mean that the colour of the fitting does not degrade when the fitting is exposed to the light and high temperatures of artificial light sources. Similarly, the coating(s) itself, either containing the colourant, the luminous material or both, is not degraded by high temperatures.

In a preferred embodiment, the fitting is retardant against fire. This is an important feature, given that the fitting is exposed to the high temperatures of artificial light sources.

Examples of fittings made according to the present invention will now be described.

Throughout this specification, including the claims, the terms "light fitting" and "fitting" are to be understood to cover all parts, fittings and attachments normally used in conjunction with artificial lights, or parts, fittings and attachments adapted for use therewith. For example, the terms are intended to include, among other things, light shades and lamp shades, light diffusers, light reflectors,

light bulbs, light tubes including fluorescent light tubes, covers of light sources, backing panels of lamps, ceiling or wall light mounting fixtures, both decorative and functional, such as rosettes, lamp sockets, strip light holders, strip light protective sleeves, and components of torches and other portable light sources. These articles in their entirety and also parts thereof are covered. Such fittings can be made in the known manner, with an additional step of providing luminescent material in accordance with the present invention.

The fitting is provided with means suitable for mounting it in the vicinity of an artificial light source. The nature of the mounting means depends on the function which the fitting is intended to play. The fitting is formed from glass, rubbers, plastics or metal materials. In this way, a wide variety of fittings can be made, as the use of glass allows for the production of light bulbs and light tubes, and plastics (particularly thermoplastics and thermosetting plastics), metals and rubbers (both synthetic and natural) can be used to produce many fixtures and fittings for the mounting of light bulbs and light tubes, and also can be incorporated into lamp shades, light covers and protectors and the like. Examples of suitable materials include acrylics, polyolefins such as high or low density polypropylene, polyethyleneterephthalate, polystyrene, ABS,

polycarbonate, phenolics, ureas, melamines, nylon 6 and nylon 66.

Any known luminescent material which is capable of being in some way incorporated with the fitting is suitable for the present invention. However, the preferred embodiment uses rare earth metals as the luminescent material. Europium or dysprosium are particularly suitable, and can be used in the form of the metal or as an oxide or aluminate thereof. A luminescent material based on rare earth metals can be improved by the addition of alkaline earth metals. Strontium and its oxides and aluminates are especially suitable.

The luminescent material is comprised within the fitting in one or more of several ways. The preferred method is to form the fitting from a glass, rubber or plastic matrix material, which has the luminescent material dispersed within it. This gives a durable fitting with a long-lasting luminous quality, because to luminescent material is not liable to wear and tear. The matrix material should preferably be of a high clarity, both to allow transmission of light from an artificial light source to charge the luminescent material, and to give good transmission of glow light subsequently emitted by the luminescent material.

Alternatively, the luminescent material can be added to a pre-formed fitting by covering the fitting with a layer, film or coating of a medium which contains the luminescent

material. This approach allows for a wider range of materials to be used to make the fitting, for example metals, which not suited to the dispersion of the luminescent material within them. Additionally, existing fitting manufacturing processes can be easily adapted to produce fittings according to the present invention, by the addition of a coating step at the end of manufacture.

Because the fitting is exposed to heat owing to its close proximity with an artificial light source, the coating should be stable up to 250 °C, so that it does not degrade through use.

However, the exposure to heat is also be advantageous, because the intensity of the luminous glow emitted by some luminescent materials increase if the material is heated, although the longevity of the glow is lessened. Thus, the luminescent material can be chosen to provide a brighter and short-lived glow, or a dimmer and more prolonged glow, depending on the intended purpose of the fitting.

A further method of providing the fitting with luminescent material is very simple, and suited to many fittings, made of any material, and even to non-luminous fittings already in use. Luminescent material can be incorporated into self-adhesive tape, or possible heat-bonded tape, which is then quickly and simply applied to the fitting.

The fitting is retardant against fire. This is not essential, but makes for a safer fitting, given that the fitting is exposed to high levels of heat in the neighbourhood of the artificial light source. Many suitable ways of providing for fire-retardancy are well-known; these include coating all or part of the fitting with a lacquer having a fire-retardant additive; incorporating a fire retardant additive or a fire retardant filling agent into the material from which the fitting is made (suitable for glass, plastics and rubber fittings); using materials with high melting points; and adding a fire-retardant outer layer during the process of co-injection moulding for fittings made by this method.

A further embodiment of the present invention relates to a fitting as described above, but further comprising a colourant material. This is used to give a desirable and/or appropriate colour to the fitting, in place of the typical dull dirty green colour common in luminous and phosphorescent materials. In the most preferred embodiment, the colourant imparts a white colour to the fitting. This makes the fitting entirely suitable for use with most existing light fixtures, which are commonly made from white plastics materials.

Pigment colourants are preferred, and are provided in a polyamide co-condensate carrier which is added, along with the luminescent material, to the matrix material from which

the fitting is to be made. The carrier makes the colourant compatible with rubber and plastics materials.

The colourant can be provided in this way, by adding it to the fitting material, or can be provided as a coating applied to the surface of the fitting. For this latter constriction, the coating material should be stable up to 250 °C, to avoid damage caused by heat from the artificial light source. In all cases, the colorant itself should be stable up to the same temperature, for the same reason. Additionally, the colourant should be light fast and stable to ultra-violet light, so that the colour of the fitting does not degrade with prolonged exposure to the artificial light.

An especially preferred embodiment of the present invention is a fitting made from the improved luminous materials described in our co-pending application for "Improved luminous materials". As described in detail in that application, these materials comprise a rubber, glass or plastics material matrix, a luminescent material dispersed throughout the matrix, and a colourant dispersed throughout the matrix, the colourant giving the matrix a colour when it is observed under substantially white light, and the colourant allowing substantial transmission of light emitted by the luminous material. Thus the materials have both the properties of high visibility, owing to the colourant, and high luminosity, thanks to the colourant not

acting to quench the glow of the luminous material. A small amount of colorant, just sufficient to provide adequate colouration of the luminous material, gives the least possible quenching whilst still performing the function of colouring.

With respect to the present invention, the property of high visibility of these materials is not essential, because it is desirable for them to blend in to existing surroundings and appear to be nothing more than a conventional light fitting. However, one embodiment of these materials uses colourants which give white colour to the material, and this is very well-suited to the present invention, as so many light fittings are conventionally white. The other embodiments of the improved materials are also suitable, however, and use of them falls within the scope of the present invention.

The white material is based on a high clarity engineering grade polymer material matrix, suitable polymers including polyurethane, co-polymers of styrene and butadiene, polyolefins, acrylic, ABS, polyethyleneterephthalate, polycarbons, PC-ABS alloys, polyethylene butyl tersthylene, modified polypropylene, PET, and most preferably, polyamides. Luminescent materials comprising rare earth metals and alkaline earth metals as described above are used, and the white colourant is a pigment, comprising one or more of titanium dioxide, calcium

carbonate, silicon dioxide, or other translucent white colourants. A combination of titanium dioxide and silicon dioxide is preferred.

Use of the fitting requires it to be mounted in the vicinity of the artificial light source from which it is going to be charged. A proximity of not more than 30 cm is preferred. The method of mounting will depend on the type of fitting, for example, fastening a lamp shade around a light bulb in the known manner. In the case of a fitting which is itself comprised within the light source or housing for a light source, e.g. a light bulb or fluorescent tube having luminescent material in its glass, the mounting is the connection of the fitting into sockets and the like to provide the required electrical connection, also in the known manner.

Once mounted, the luminescent material in the fitting absorbs part of the light emitted by the artificial light source when the light source is illuminated, and is hence charged. When the light source is extinguished, the luminescent material emits a luminous glow, so that the fitting "glows in the dark".

There are a number of applications for a fitting according to the present invention, relating to situations in which a source of light is required after an artificial light is extinguished. For example, a fitting will provide immediate emergency lighting in the event of a power

failure, without the need to operate any switches, or other human intervention. Similarly, it provides a convenient alternative light source if electrical lighting needs to be extinguished for reasons of safety or power conservation. Also, a fitting can be used as a night light, as it will provide a low level of illumination after its associated artificial light is turned off, giving increased security and safety to persons in the vicinity.

Claims

1. A light fitting for mounting in proximity to an associated artificial light source, the fitting comprising luminescent material which, in use, is charged by light emitted from the light source so that the fitting produces a glow when the artificial light source is extinguished.

2. A light fitting according to claim 1, in which the fitting is made from rubber, glass or a plastics material and the luminescent material is incorporated within the matrix of the fitting material.

3. A light fitting according to claim 1, in which the luminescent material is provided in a coating applied to the surface of the fitting.

4. A light fitting according to any preceding claim, in which the luminescent material is provided in an adhesive tape applied to the surface of the fitting.

5. A light fitting according to any preceding claim, in which the luminescent material comprises a rare earth metal.

6. A light fitting according to claim 5, in which the rare earth metal is europium or dysprosium.

7. A light fitting according to claim 5 or claim 6, in which the luminescent material further comprises an alkaline earth metal.

8. A light fitting according to claim 7, in which is preferably strontium.

9. A light fitting according to any preceding claim, in which the fitting further comprises a colourant material.

10. A light fitting according to claim 9, in which the colourant material is a pigment.

11. A light fitting according to claim 10, in which the pigment is provided in a polyamide co-condensate carrier which is compatible with rubber or plastics materials.

12. A light fitting according to any one of claims 9 to 11, in which the colourant material imparts a white colour to the fitting.

13. A light fitting according to any one of claims 9 to 12, in which the colorant material is stable up to 250 °C.

14. A light fitting according to any one of claims 9 to 13, in which the colourant material is light-fast and stable to ultra-violet light.

15. A light fitting according to claim 2 and any claim read appendant thereto, in which the coating or coatings are stable up to 250 °C.

16. A light fitting according to any preceding claim, in which the fitting is retardant against fire.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
26 September 2002 (26.09.2002)

PCT

(10) International Publication Number
WO 02/075205 A3

(51) International Patent Classification[7]: F21V 9/16

(21) International Application Number: PCT/GB02/01340

(22) International Filing Date: 21 March 2002 (21.03.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0107077.0 21 March 2001 (21.03.2001) GB

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report:
13 March 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 02/075205 A3

(54) Title: LIGHT FITTINGS

(57) Abstract: A light fitting for mounting in proximity to an associated artificial light source, the fitting comprising luminescent material which, in use is charged by light emitted from the light source so that the fitting produces a glow when the artificial light source is extinguished.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 02/01340

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F21V9/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F21V

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 161 388 A (BOUCHARD ANDRE C ET AL) 17 July 1979 (1979-07-17) column 2, line 39 - line 51 column 3, line 35 - line 58 column 4, line 3 - line 8 column 4, line 22 - line 30 claims 1,4; figures 1-3	1-3,5-8, 15
X	US 5 757 111 A (SATO GIICHIRO) 26 May 1998 (1998-05-26) column 3, line 33 - line 38 column 3, line 41 - line 61 column 4, line 30 - line 36 column 5, line 55 -column 6, line 50 figures 1,2,6,6	1-4

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 October 2002	10. 01. 2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	DE MAS A.G.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 02/01340

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 245 282 A (SOKOL PETER L) 13 January 1981 (1981-01-13) claims 1-4; figures 1-3	1-3
X	DE 89 13 541 U (FRANKAUER) 11 January 1990 (1990-01-11) page 5, line 23 - line 28 page 6, line 11 - line 17 page 6, line 23 - line 24 figures 1,2	1,2
X	US 4 481 560 A (RA CHANG H) 6 November 1984 (1984-11-06) column 2, line 8 - line 15 claim 1; figure 1	1,2
X	EP 1 026 440 A (MATARRODONA MARTINEZ JORGE) 9 August 2000 (2000-08-09) column 2, line 16 - line 42 claims 1-3; figures 1-3	1-3,5-8, 15

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/GB 02/01340

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-8,15

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-8,15

   Light fitting comprising a luminescent material

2. Claims: 9-14

   Light fitting comprising a colourant material

3. Claim : 16

   Light fitting retardant against fire

INTERNATIONAL SEARCH REPORT
Information on patent family members

national Application No
PCT/GB 02/01340

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